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Spring 2021

### CHEM 412-002: Inorganic Reactions & Processes

Michael Eberhart

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Eberhart, Michael, "CHEM 412-002: Inorganic Reactions & Processes" (2021). *Chemistry, Environmental and Forensic Science Syllabi*. 350.

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Chemistry 412/610:  
*Spring 2021 Course Syllabus*

## COURSE INFORMATION

Instructor: Prof. Michael Eberhart

Email: [michael.s.eberhart@njit.edu](mailto:michael.s.eberhart@njit.edu), Office: 351 Tiernan Hall, Phone: 973-596-6994

Office hours: Wednesdays 3:30-4:30 PM and other times by appointment. Office hours will be held via Webex (details listed in Canvas). In person office hours may be available by appointment when conditions permit.

**Course Description:** Chem 412 – Inorganic Reactions & Processes (3 credits)  
Chem 610 – Advanced Inorganic Chemistry (3 credits)

The course covers structure, bonding, properties, and reactivity in inorganic chemistry. Topics covered will include inorganic structure/bonding, molecular orbitals, coordination chemistry, organometallic chemistry, catalysis, symmetry, and group theory.

**Prerequisite for Chem 412:** Organic Chemistry. Many concepts in this course build upon topics from courses that are expected to have been taken earlier in the chemistry curriculum.

**Canvas:** Important course information including announcements, assignments, exams, quizzes, and details about office hours will be posted. Assignments must be submitted via Canvas.

**Google Drive:** Answer keys and lecture slides are posted on the class shared drive  
<https://drive.google.com/drive/folders/0APCIQrs78PqSUk9PVA>

### Required Textbook:

<b>Title</b>	Inorganic Chemistry
<b>Authors</b>	Gary L. Miessler, Paul J. Fischer, and Donald A. Tarr
<b>Edition</b>	5 <sup>th</sup>
<b>Publisher</b>	Pearson
<b>ISBN</b>	ISBN-13: 978-0-321-81105-9/ ISBN-10: 0-321-81105-4

**Teamwork and Collaboration:** Teamwork is an important skill for any scientist and formation of study groups is strongly encouraged. You may work with others on homework/problem sets, however you are responsible for knowing how to solve the problems on your own. Quizzes and exams are to be completed alone without assistance from others.

## Learning Outcomes:

- Predict structure, physical properties, and chemistry of coordination compounds
- Predict structure, physical properties, and chemistry of organometallic compounds
- Understand characterization techniques for inorganic species including UV-vis, IR, Raman, NMR, X-ray/neutron diffraction
- Describe the bonding in inorganic compounds
- Be familiar with common reaction mechanisms of coordination and organometallic complexes
- Learn experimental techniques and strategies to elucidate reaction mechanisms and understand experimental strategies that might be used to control chemical reactions on the basis of mechanistic understanding
- Understand/apply symmetry and group theory

## POLICIES

All CES students must familiarize themselves with, and adhere to, all official university-wide student policies. CES takes these policies very seriously and enforces them strictly.

Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at:  
<http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf>.

It is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university. If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at [dos@njit.edu](mailto:dos@njit.edu)

**Grading Policy:** The final grade in this course will be determined as follows:

Class Participation, Group Discussion, In Class Questions: 10%

Quizzes: 10%

Homework/Problem Sets: 15%

Midterm 1: 20%

Midterm 2: 20%

Final Exam: 25%

Your letter grade is assigned based on the following tentative curve:

A 100-90%

B+ 89-88%

B 80-87%

C+ 77-79%

C 70-76%

D 60-69%

F <60%

**Attendance Policy:** Each class is a learning experience that cannot be replicated through simply “getting the notes.” Active participation and discussion are expected.

**Homework and Problem Sets:** Homework is an expectation of the course. Before each exam, a comprehensive problem set will be distributed through Canvas and is intended as exam preparation. Additional smaller homework assignments may be assigned from time to time.

**Quizzes:** Quizzes will be graded similarly to exams but are shorter, given more frequently, and make up a smaller percentage of your grade. The two lowest quiz scores will be dropped from your grade calculation.

**Exams:** There will be two midterm exams held during the semester and one comprehensive final exam. Exams and other assignments will be submitted electronically. The following exam periods are tentative and therefore possibly subject to change:

Midterm Exam I	Friday, February 25
Midterm Exam II	Friday, April 9
Final Exam Period	May 7 <sup>th</sup> – May 13 <sup>th</sup>

**Exam Proctoring:** Exams will be proctored using Respondus Monitor/Lockdown Browser within Canvas. Exams will require a computer with a webcam. Handwritten answers/drawings may be required for some exam problems. These should be scanned and uploaded to Canvas promptly after finishing the exam. Exams must be started on time.

**Makeup Exam Policy:** There will normally be **NO MAKE-UP QUIZZES OR EXAMS** during the semester. In the event that a student has a legitimate reason for missing a quiz or exam, the student should contact the Dean of Students office and present written verifiable proof of the reason for missing the exam, e.g., a doctor's note, police report, court notice, etc. clearly stating the date AND time of the mitigating problem. The student must also notify the CES Department Office/Instructor that the exam will be missed so that appropriate steps can be taken to make up the grade.

## ADDITIONAL RESOURCES

**Accommodation of Disabilities:** Office of Accessibility Resources and Services (*formerly known as Disability Support Services*) offers long term and temporary accommodations for undergraduate, graduate and visiting students at NJIT.

If you are in need of accommodations due to a disability please contact Chantonette Lyles, Associate Director at the Office of Accessibility Resources and Services at **973-596-5417** or via email at [lyles@njit.edu](mailto:lyles@njit.edu). The office is located in Fenster Hall Room 260. A Letter of Accommodation Eligibility from the Office of Accessibility Resources Services office authorizing your accommodations will be required.

For further information regarding self-identification, the submission of medical documentation and additional support services provided please visit the Accessibility Resources and Services (OARS) website at:

<https://www.njit.edu/studentsuccess/accessibility>

**Important Dates:** See the Spring 2021 Academic Calendar

<https://www5.njit.edu/registrar/calendars>

**University-wide Withdrawal Date:** The last day to withdraw with a W is Monday April 5<sup>th</sup>. It will be strictly enforced.

**Topics Covered:**

A detailed schedule is available on Canvas and will be kept up to date

Introduction to Inorganic Chemistry (Chapter 1)

Atomic Structure as it pertains to bonding in Inorganic Chemistry (Chapter 2.2, 2.3)

Basic Structure and Bonding (Chapter 3)

Symmetry and Group Theory (Chapter 4)

Molecular Orbitals (Chapter 5)

Acid-Base and Donor-Acceptor Chemistry (Chapter 6)

The Crystalline Solid State (Chapter 7 and other resources)

Main Group Chemistry (Chapter 8)

Coordination Chemistry (Chapters 9-12)

Organometallic Chemistry (Chapters 13,14)